

CLAIMS

1. (Amended) A well treatment fluid for use in a well, the well treatment fluid comprising:
 - (a) water;
 - (b) an amine-based polymer, wherein the amine-based polymer comprises a chitosan-based polymer;
 - (c) a polysaccharide-based polymer; and
 - (d) an oxidizing agent that is capable of at least partially oxidizing at least the polysaccharide-based polymer.
2. (Canceled)
3. (Amended) The method according to Claim 2 4, wherein the step of forming the well treatment fluid is prior to contacting the subterranean formation.
4. (Amended) The method of Claim 2, further comprising the step of: A method of treating a subterranean formation penetrated by a wellbore, the method comprising the steps of:
 - (a) forming a well treatment fluid comprising:
 - (i) water;
 - (ii) an amine-based polymer;
 - (iii) a polysaccharide-based polymer; and
 - (iv) an oxidizing agent that is capable of at least partially oxidizing at least the polysaccharide-based polymer;
 - (b) contacting the well treatment fluid with the subterranean formation; and
 - (c) contacting the well treatment fluid with a second oxidizing agent that is capable of at least partially oxidizing at least a portion of the polysaccharide-based polymer within the subterranean formation after the well treatment fluid contacts the subterranean formation, which second oxidizing agent may be the same or different from the oxidizing agent of the well treatment fluid.

5. (Amended) The method of Claim 2 A method of treating a subterranean formation penetrated by a wellbore, the method comprising the steps of:

(a) forming a well treatment fluid comprising:

(i) water;

(ii) an amine-based polymer, wherein the amine-based polymer comprises at least one member selected from the group of chitosan, chitosan salts, oxidized chitosan, poly(vinyl alcohol-vinyl amine), polylysine, polyethyleneimine, and any combination in any proportion thereof.

(iii) a polysaccharide-based polymer; and

(iv) an oxidizing agent that is capable of at least partially oxidizing at least the polysaccharide-based polymer; and

(b) contacting the well treatment fluid with the subterranean formation.

6. (Amended) The method of Claim 2 A method of treating a subterranean formation penetrated by a wellbore, the method comprising the steps of:

(a) forming a well treatment fluid comprising:

(i) water;

(ii) an amine-based polymer; wherein the amine-based polymer comprises a chitosan-based polymer,

(iii) a polysaccharide-based polymer; and

(iv) an oxidizing agent that is capable of at least partially oxidizing at least the polysaccharide-based polymer; and

(b) contacting the well treatment fluid with the subterranean formation.

7. (Original) The method of Claim 6, wherein the chitosan-based polymer comprises chitosan, chitosan salts, oxidized chitosan, or any combination of the foregoing in any proportion thereof.

8. (Original) The method of Claim 6, wherein the chitosan-based polymer comprises an oxidized chitosan-based polymer.

9. (Original) The method of Claim 8, wherein the oxidized chitosan-based polymer is prepared by oxidizing a chitosan-based polymer selected from the group consisting of chitosan, chitosan salts, or any combination thereof in any proportion.

10. (Original) The method of Claim 9, wherein the oxidized chitosan-based polymer is prepared by oxidizing a chitosan-based polymer with an oxidizer selected from the group consisting of sodium hypochlorite, sodium periodate, hydrogen peroxide, peracetic acid, and any mixture thereof in any proportion thereof.

11. (Original) The method of Claim 9, wherein the oxidized chitosan-based polymer is present in an amount of at least 3 wt % by weight of the composition.

12. (Original) The method of Claim 9, wherein the oxidized chitosan-based polymer is present in an amount of up to about 10 wt % by weight of the composition.

13. (Amended) The method of Claim 2 6, wherein the weight ratio of the amine-based polymer to polysaccharide-based polymer is from about 50:1 to about 1:50.

14. (Amended) The method of Claim 2 6, wherein the polysaccharide-based polymer is selected from the group consisting of starch, cellulose, agarose, partially-acetylated cellulose, hydroxyl ethyl cellulose, gum, and any combination in any proportion thereof.

15. (Original) The method of Claim 14, wherein the gum is selected from the group consisting of guar, locust bean gum, gum arabic, tragacanth, gutta percha, xanthan salts, alginate salts, carrageenan, scleroglucan, and any combination in any proportion thereof.

16. (Amended) The method of Claim 2 6, wherein the polysaccharide-based compound is starch.

17. (Original) The method of Claim 16, wherein the starch is present in an amount up to about 10 wt% by weight of the composition.

18. (Amended) The well treatment fluid or the method according to Claim 16, wherein the weight ratio of the starch to the amine-based polymer is from about 30:1 to about 1:30.

19. (Original) The method of Claim 6, wherein the oxidizing agent is capable of oxidizing the chitosan-based polymer and the polysaccharide-based polymer which then allows them to crosslink in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

20. (Original) The method of Claim 6, wherein the oxidizing agent is capable of oxidizing the chitosan-based polymer to allow the oxidized polymer to at least partially self-crosslink in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

21. (Original) The method of Claim 6, wherein the oxidizing agent is capable of oxidizing the polysaccharide-based polymer to allow the oxidized polysaccharide to at least partially self-crosslink in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

22. (Original) The method of Claim 6, wherein the oxidizing agent is capable of oxidizing the polysaccharide-based polymer to form an oxidized polysaccharide-based polymer and at least a portion thereof crosslinks with the chitosan-based polymer in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

23. (Original) The method of Claim 6, wherein the oxidizing agent is capable of oxidizing at least a portion of the chitosan-based polymer to form an oxidized chitosan-based polymer and is capable of oxidizing at least a portion of the polysaccharide-based polymer to form an oxidized polysaccharide-based polymer, and at least a portion of the oxidized chitosan-based polymer crosslinks with at least a portion of the oxidized polysaccharide-based polymer in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

24. (Amended) The method of Claim 2 6, wherein the oxidizing agent is selected from the group consisting of alkali, alkaline earth and transition metal salts of periodate, hypochlorite, perbromate, chlorite, chlorate, hydrogen peroxide, soluble peroxide salts, persulfate salts, percarboxylic acids, oxyhalo acids, and any combination thereof in any proportion thereof.

25. (Original) A method of treating a subterranean formation penetrated by a wellbore, the method comprising the steps of:

- (a) forming a well treatment fluid comprising:
 - (i) water;
 - (ii) an amine-based polymer; and
 - (iii) a polysaccharide-based polymer;
- (b) contacting the subterranean formation with the well treatment fluid; and
- (c) contacting the subterranean formation with an oxidizing agent that is capable of at least partially oxidizing at least a portion of the polysaccharide-based polymer in contact with said formation.

26. (Original) The method of Claim 25 wherein the amine-based polymer comprises at least one member selected from the group of chitosan, chitosan salts, oxidized chitosan, poly(vinyl alcohol-vinyl amine), polylysine, polyethyleneimine, and any combination in any proportion thereof.

27. (Original) The method of Claim 25 wherein the amine-based polymer comprises a chitosan-based polymer.

28. (Original) The method of Claim 27 wherein the chitosan-based polymer comprises chitosan, chitosan salts, oxidized chitosan, or any combination of the foregoing in any proportion thereof.

29. (Original) The method of Claim 28 wherein the chitosan-based polymer comprises an oxidized chitosan-based polymer.

30. (Original) The method of Claim 29 wherein the oxidized chitosan-based polymer is prepared by oxidizing a chitosan-based polymer selected from the group consisting of chitosan, chitosan salts, or any combination thereof in any proportion.

31. (Original) The method of Claim 29 wherein the oxidized chitosan-based polymer is prepared by oxidizing a chitosan-based polymer with an oxidizer selected from the group consisting of sodium hypochlorite, sodium periodate, hydrogen peroxide, peracetic acid, and any mixture thereof in any proportion thereof.

32. (Original) The method of Claim 29 wherein the oxidized chitosan-based polymer is present in an amount of at least 3 wt % by weight of the composition.

33. (Original) The method of Claim 29, wherein the oxidized chitosan-based polymer is present in an amount of up to about 10 wt % by weight of the composition.

34. (Amended) The well treatment fluid or the method according to Claim 29 wherein the weight ratio of the oxidized chitosan-based polymer to polysaccharide-based polymer is from about 50:1 to about 1:50.

35. (Original) The method of Claim 25 wherein the polysaccharide-based polymer is selected from the group consisting of starch, cellulose, agarose, partially-acetylated cellulose, hydroxyl ethyl cellulose, gum, and any combination in any proportion thereof.

36. (Original) The method of Claim 35 wherein the gum is selected from the group consisting of guar, locust bean gum, gum arabic, tragacanth, gutta percha, xanthan salts, alginate salts, carrageenan, scleroglucan, and any combination in any proportion thereof.

37. (Original) The method of Claim 25 wherein the polysaccharide-based compound is starch.

38. (Original) The method of Claim 37 wherein the starch is present in an amount up to about 10 wt% by weight of the composition.

39. (Original) The method of Claim 37 wherein the weight ratio of the starch to the amine-based polymer is from about 30:1 to about 1:30.

40. (Original) The method of Claim 27 wherein the oxidizing agent is capable of oxidizing at least a portion of the chitosan-based polymer and the polysaccharide-based polymer which them allows them to at least partially crosslink in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

41. (Original) The method of Claim 27 wherein the oxidizing agent is capable of oxidizing at least a portion of the chitosan-based polymer to allow the oxidized chitosan to at least partially self-crosslink in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

42. (Original) The method of Claim 27 wherein the oxidizing agent is capable of oxidizing the polysaccharide-based polymer to allow at least a portion of the oxidized polysaccharide to at least partially self-crosslink in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

43. (Original) The method of Claim 27 wherein the oxidizing agent is capable of oxidizing at least a portion of the polysaccharide-based polymer to form an oxidized polysaccharide-based polymer and at least a portion thereof crosslinks with the chitosan-based polymer in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

44. (Original) The method of Claim 27 wherein the oxidizing agent is capable of oxidizing at least a portion of the chitosan-based polymer to form an oxidized chitosan-based polymer and is capable of oxidizing at least a portion of the polysaccharide-based polymer to form an oxidized polysaccharide-based polymer, and at least a portion of the oxidized chitosan-based polymer crosslinks with the oxidized polysaccharide-based polymer

in the water to produce a gel having a viscosity of greater than or equal to about 20 cp when measured at a pH of about 4 to about 7 and at STP.

45. (Amended) The method of Claim 25 wherein the oxidizing agent is present in a sufficient concentration to oxidize from about 1% to about 25% of the glucose units of the polysaccharide-based polymer.

46. (Original) The method of Claim 25 wherein the oxidizing agent is selected from the group consisting of alkali, alkaline earth and transition metal salts of periodate, hypochlorite, perbromate, chlorite, chlorate, hydrogen peroxide, soluble peroxide salts, persulfate salts, percarboxylic acids, oxyhalo acids, and any combination thereof in any proportion thereof.

47. (Original) The method of Claim 25 wherein the water for the well treatment fluid is selected from the group consisting of fresh water, seawater, natural brine, formulated brine, 2% KC1 solution, and any combination thereof in any proportion thereof.

48. (New) The method of Claim 6 wherein the oxidizing agent is present in a sufficient concentration to oxidize from about 1% to about 25% of the glucose units of the polysaccharide-based polymer.